Appendix C
Data Usability Assessment Report

The purposes of this data usability and assessment report (DUAR) are to 1) summarize the data validation performed on the data sets for the Historic Site Assessment (HSA) Subarea 5D North and 5D South samples collected, and 2) determine whether the sample results meet the Data Quality Objectives (DQOs) outlined in the *Master Work Plan/Field Sampling and Anlaysis Plan, Co-Located Chemical Sampling at Area IV, Santa Susana Field Laboratory, Ventura County, California (CDM Federal Programs Corporation* [CDM] 2011a) (WP/FSAP) *Addendum No. 4 to Master Work Plan/Field Sampling and Analysis Plan, Co-Located Chemical Sampling at Area IV, Santa Susana Field Laboratory, Ventura County, California, EPA Subarea 5D North Soil Sampling* (CDM 2011b) (WP/FSAP Addendum) and *Addendum No. 6 to Master Work Plan/Field Sampling and Analysis Plan, Co-Located Chemical Sampling at Area IV Santa Susana Field Laboratory, Ventura County, California, EPA Subareas 3, 5D South, 7 and 8 South Soil Sampling* (CDM 2011c).

A total of 498 soil samples were collected and analyzed from 13 drainage locations, 73 surface locations, and 186 soil boring locations for Subarea 5D North. For Subarea 5D South 59 soil samples were collected and analyzed two drainage locations, 30 surface locations, and 20 soil boring locations.

C.1 Usability Summary

For this data usability assessment, 117 data sets were reviewed. A data set consists of 20 or fewer samples grouped together by analytical method for analyses depending on the time and date of when the samples were received by the laboratory. A data set is called a sample delivery group, or SDG. The analyses performed are discussed in Section 2.5 of the Subarea 5D North and 5D South Technical Memorandum (TM).

Samples were collected and analyzed in accordance with the WP/FSAP (CDM 2011a). Deviations were encountered during the field investigation for the Subarea 5D North and 5D South sampling activities and are discussed in detail in Section 2.7 of the Subarea 5D North and 5D South TM.

The validated data for Subareas 5D North and 5D South samples are usable as reported, with the exception of the rejected data. One fluoride result, one antimony result, one ethanol result, one m-terphenyl result, one p-terphenyl result, three EFH results, 72 pesticide results, ten PCB results, 50 herbicide results, 11 SVOC results and 30 explosive results were rejected for Subarea 5D North sample data. For all Subarea 5D North data, 0.18 percent of the results were rejected. For Subarea 5D South data one pesticide result, 16 herbicide results and four SVOC results were rejected. For all Subarea 5D South data, 0.23 percent of the results were rejected. These rejected data do not impact project objectives and goals. Specific details are provided in the validation reports in this Appendix and below in Section C.8.

C.2 Data Validation Procedures

Data were validated by the independent data validation firm Laboratory Data Consultants, Inc. All data validation was conducted in accordance with *U.S. Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 2004), *EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA 2008), and *EPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (EPA 2005).

The data validation strategy employed was to validate 10 percent of the data according to EPA Level IV protocols (all QC parameters and raw data) and the remaining 90 percent according to EPA Level III (all QC parameters except calibrations and raw data) protocols.

Table C-1 shows all SDGs that include Subarea 5D North and 5D South samples and which SDGs were validated as Level III or Level IV. Some SDGs contain samples from other subareas[1] but all samples in an SDG were validated together.

In order to evaluate the quality of the laboratory and the validation firm, CDM Smith chemists reviewed 10 percent of the Subarea 5D North and 5D South sample SDGs. The purpose of the review was to identify any quality control issues with the laboratory not identified by the validation firm or any discrepancies in validation procedures by the validation firm. No additional qualifiers were applied to the data based on CDM Smith's review.

C.3 Quality Assurance Objectives

Quality assurance (QA) objectives for measurement data are expressed in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). The QA objectives provide a mechanism for evaluating and measuring data quality.

A review of the collected data is necessary to determine if data quality objectives established in the WP/FSAP (CDM 2011a and 2011b) have been met. The following data measurement tasks were evaluated:

- Specification and adherence to analytical method and reporting detection limit requirements
- Identification of the appropriate laboratory analytical QC requirements and verification of whether these QC requirements were met

[1] During sampling in Subarea 5D North and 5D South, EPA transitioned sampling into other subareas. Thus some sample delivery groups may contain results for samples from multiple Subareas.

- Verification that measurement performance criteria (representativeness and completeness) for the data have been met

- Verification that field procedures were followed, deviations were documented, and determination of impact on data quality from these deviations

The data validation review determines if the collected data are of sufficient quality (except for the rejected results) to support their intended use.

C.4 Summary of Field and Laboratory QA Activities

CDM completed sampling activities in Subarea 5D North and 5D South in accordance with the approved WP/FSAP (CDM 2011a). A total of 498 soil samples were collected and analyzed from 13 drainage locations, 73 surface locations, and 89 soil boring locations for Subarea 5D North. For Subarea 5D South 59 soil samples were collected and analyzed from two drainage locations, 30 surface locations, and 20 soil boring locations. Tables 2-1 and 2-2 in the Subarea 5D North and 5D South TM provide a summary of the samples collected and the laboratory analyses requested.

Table C-1 in this report presents the SDGs and validation level for the HSA Subarea 5D North and 5D South sample data. An index of samples associated with each SDG is presented at the beginning of the data validation reports presented in this appendix. The WP/FSAP (CDM 2011a) defined the procedures to be followed and the data quality requirements for the field sampling events.

C.5 Field Quality QA/QC

Field QC samples, such as matrix spike/matrix spike duplicates (MS/MSDs) and field duplicates, were to be collected at a frequency of 1 per 20 samples (5 percent) for MS/MSDs and field duplicates. MS/MSD and field duplicate samples were collected by CDM at 25 sample locations for Subarea 5D North and four sample locations for Subarea 5D South. As discussed in the TM, collection frequency of MS/MSDs was changed. MS/MSD and field duplicate samples met the frequency requirements detailed in the WP/FSAP (CDM 2011a) and in accordance with the changes implemented.

Twenty-four equipment rinsate blank samples were collected for Subarea 5D North and three were collected for Subarea 5D South. The equipment rinsate blank results are presented in Table C-2 and Table C-3.

No field blanks were collected during sampling for 5D North and 5D South. The field blank associated with this ASTM decontamination water has been applied to the 5D North and 5D South samples accordingly.

Forty-six trip blank samples were shipped with the Subarea 5D North soil samples and eight trip blank samples were shipped with the Subarea 5D South samples. The results for these samples are presented in Tables C-4 and C-5. Data qualifications

based on blank detections are discussed in Section C.7.3 and in the Appendix C validation reports.

Temperature blanks were to be included with each shipment of samples. Based on validation results, all temperature blanks for 5D North and 5D South met criteria.

The number of field QC samples collected satisfies the minimum requirements for the Subarea 5D North and 5D South sampling events specified in the WP/FSAP (CDM 2011a) and any implemented modifications. Field QA/QC objectives were accomplished through the use of appropriate sampling techniques and collection of the required QC samples at the required frequencies.

C.6 Laboratory Quality QA/QC

Analytical QA/QC was assessed by laboratory QC checks, method blanks, sample custody tracking, sample preservation, adherence to holding times, laboratory control samples (LCSs), MSs, calibration recoveries, surrogates, tuning criteria, second column confirmations, internal standards, serial dilutions, laboratory duplicates, and interference check standards. The majority of the laboratory QC sample criteria met project requirements as indicated in the data validation reports in this appendix with the appropriate qualifiers applied. One hundred and eighty-one individual analyte results for samples from Subarea 5D North (0.18 percent of all the analytes) and 21 individual analyte results for samples from Subarea 5D South (0.23 percent of all analytes) were rejected as discussed below and in the validation reports presented in this appendix.

C.7 Data Quality Indicators

This section summarizes the validation performed. Individual SDG validation reports with specific sample detail are provided in this appendix.

Achievement of the DQOs was determined in part by the use of data quality indicators (DQIs) as described in the WP/FSAP (CDM 2011a). These DQIs for measurement data are expressed in terms of PARCCS. The DQIs provide a mechanism for ongoing control to evaluate and measure data quality throughout the project. These criteria are defined in the sections below.

C.7.1 Precision

Precision is a quantitative term that estimates the reproducibility of a set of replicate measurements under a given set of conditions. It is defined as a measurement of mutual agreement between measurements of the same property and is expressed in terms of relative percent difference (RPD) between duplicate determinations.

RPD is calculated as follows:

$$\text{RPD} = \text{absolute value } [(C1-C2)/\{(C1+C2)/2)\}] \times 100\%$$

Where:

C1 = concentration of primary sample
C2 = concentration of duplicate sample

Field and analytical precision were determined from the review of the field duplicate results. The sample results were compared by calculating their RPDs. The field duplicate samples were collected in the same manner as the original samples but were collected in separate, individual containers, given separate sample identifiers, and treated as individual samples by the laboratory.

Laboratory duplicate RPD control limits are presented in the WP/FSAP (CDM 2011a) or are laboratory specific. For laboratory duplicates, if one or both of the sample results were less than two times the RL, a control limit of the absolute difference equal to the RL value was used for comparison.

The field duplicate RPD criterion is 50 percent. Field duplicates for this project were validated using the following: If one result is non-detect and the other result is above the RL, the RPD result is shown as 200 percent and the field duplicate sample and parent sample results are qualified as estimated "J" or "UJ." If the field duplicate RPD was above the 50 percent criterion (and both sample results were above the RL), the field duplicate and parent sample results for that analyte were qualified as estimated "J."

Qualifiers were applied to applicable sample analyte results during the validation process based on laboratory and field duplicate precision results. Details are discussed in the laboratory validation reports in this appendix. Table C-6 and Table C-7 show the field duplicate pairs and RPD results for Subareas 5D North and 5D South respectively. RPD results outside of criteria are highlighted.

The following individual analyte results were qualified as estimated "J/UJ" based on precision criteria for Subarea 5D North samples:

- Twenty-eight dioxin results, 34 pesticide results, 16 PCB/PCT results and 12 herbicide results were qualified as estimated based on second column RPD results

- Eight dioxin results; 31 fluoride/nitrate results; 2,713 metal analyte results; 37 mercury results; one TPH/glycol result; 12 PCB/PCT results; 14 SVOC SIM results; and four energetic results were qualified as estimated based on laboratory precision criteria

- One hundred and sixty-one dioxin results; four NDMA results; six fluoride/nitrate results; 36 metal results; nine hexavalent chromium results; 13 mercury results; one alcohol/terphenyl result; 14 TPH/glycol results; 28 pesticide results; 20 PCB/PCT results; 13 herbicide results; 13 VOC results; one SVOC result; and 110 SVOC SIM results were qualified based on field duplicate criteria

The following individual analyte results were qualified as estimated "J/UJ" based on precision criteria for Subarea 5D South samples:

- Two fluoride/nitrate results, 170 metal analyte results and 27 PCB/PCT results were qualified as estimated based on laboratory precision criteria
- Twenty-six dioxin results; four metal results; two hexavalent chromium results; eight pesticide results; four PCB/PCT results; one herbicide result; one SVOC result; and 15 SVOC SIM results were qualified based on field duplicate criteria

There was no discernable pattern or reason for the laboratory and field sample RPD exceedances identified. No field sampling issues were identified from the RPD results that were outside of criteria and the exceedances are reasonable for this type of sampling activity. Sample results that have been qualified as estimated "J/UJ" due to precision criteria are usable for project decisions with a degree of caution.

C.7.2 Accuracy

Accuracy is the degree of agreement between a measurement and the accepted reference or true value and is a measure of the bias in a system. Accuracy of the data was assessed by comparing LCS recovery, MS recovery, calibration recovery, Inductively Coupled Plasma (ICP) interferences, and by performing serial dilution checks during metals analyses. Accuracy is expressed as percent recovery (%R), which is calculated by:

$$\textbf{Percent Recovery} = \left(\frac{\textbf{Total Analyte Found} - \textbf{Analyte Originally Present}}{\textbf{Analyte Added}}\right) \times 100$$

Analytical accuracy for the entire data collection activity is difficult to assess because several sources of error exist. Errors can be introduced by any of the following:

- Sampling procedure
- Field contamination
- Sample preservation and handling
- Sample matrix
- Sample preparation
- Analytical techniques

Accuracy is maintained to the extent possible by adhering to the EPA method and approved field and analytical standard operating procedures.

Qualifiers were applied to applicable sample analyte results during the validation process based on laboratory accuracy results and are discussed in detail in the laboratory validation reports in Appendix C.

The following individual analyte results were qualified as nondetect “U” or nondetect estimated “UJ" based on accuracy criteria for Subarea 5D North samples:

- Two thousand and five metal analyte results were qualified as estimated based on inductively coupled plasma serial dilution results

- Two-hundred and seventy-three pesticide results, 122 PCB/PCT results and 35 VOC results were qualified as estimated based on calibration criteria

- Thirty-eight metal results; four TPH/glycol results; 54 pesticide results; 22 PCB/PCT result; 49 herbicide results; 55 VOC results; 379 SVOC results; 105 SVOC SIM; seven formaldehyde results; and 72 energetic results were qualified as estimated based on LCS percent recovery criteria

- Ten dioxin results; four NDMA results; 417 fluoride/nitrate results; three perchlorate results; 4,118 metal analyte results; 30 mercury results; 16 alcohol/terphenyl results; 42 TPH/glycol results; 26 pesticide results; seven herbicide results; seven VOC results; 85 SVOC results; 32 SVOC SIM results; two formaldehyde results; and five energetic results were qualified as estimated based on MS percent recovery criteria

- Two NDMA results; 11 alcohol/terphenyl results; 548 pesticide results; 45 PCB/PCT results; 6 herbicide results; 46 SVOC results; and four formaldehyde results were qualified as estimated based on surrogate recovery criteria

The following individual analyte results were qualified as nondetect “U” or nondetect estimated “UJ" based on accuracy criteria for Subarea 5D South samples:

- One hundred and forty-four metal analyte results were qualified as estimated based on inductively coupled plasma serial dilution results

- One perchlorate result; five PCB/PCT results; ten herbicide results; and nine SVOC results were qualified as estimated based on LCS percent recovery criteria

- One dioxin result; 43 fluoride/nitrate results; 420 metal analyte results; two pesticide results; nine herbicide results; six SVOC results; and one SVOC SIM result were qualified as estimated based on MS percent recovery criteria

- Forty-eight pesticide results, 32 PCB/PCT results and 21 SVOC SIM results were qualified as estimated based on surrogate recovery criteria

The following individual analyte results were rejected "R" based on accuracy criteria for the Subarea 5D North samples:

- One fluoride result based on MS

- One antimony result based on MS

- Three alcohol and terphenyl results (ethanol, m-terphenyl, and p-terphenyl) based on MS

- Three TPH results (EFH [C12-C14], EFH [C15-C20] and EFH [C8-C11]) based on MS
- Sixty-two pesticide results (from four samples) based on surrogates
- Ten pesticide results (from six samples) based on MSs
- Ten PCB/PCT results (from one sample) based on surrogates
- One herbicide result (dalaphon) (from one sample) based on MS
- Forty-nine herbicide results (dinoseb) (from 49 samples) based on LCSs
- Eleven SVOC results (from 11 samples) based on MSs
- Thirty energetics results (2,4-diamino-6-nitrotoluene and 2,6-diamino-4-nitrotoluene) (from 15 samples) based on LCSs

The following individual analyte results were rejected "R" based on accuracy criteria for the Subarea 5D South samples:

- One pesticide result (4'4-DDD) based on MS
- Sixteen herbicide results (nine for dinoseb and one each for 2,4,5-TP Silvex, 2,4-DB, dalaphon, diacamba, dichloroprop, MCPA and MCPP) based on MSs
- Four SVOC results (benzidine) based on MSs

Sample preservation, handling, and holding times are additional measures of accuracy of the data. All sample preservation, holding times and handling criteria were met except for one NDMA result and ten herbicide results for Subarea 5D North samples. These results were qualified as estimated "J/UJ."

Sample results that have been qualified as estimated "J/UJ" due to accuracy criteria are usable for project decisions. Results that have been rejected "R" are not usable.

C.7.3 Blank Contamination

Field blanks (e.g., equipment and trip) and laboratory method blanks are analyzed to identify possible sources of contamination. Contamination of a sample can be introduced by field sample collection methods, sample handling, preparation, and/or analysis. The laboratory validation reports in this appendix and summarized below discuss the results qualified based on field and laboratory blank contamination.

The following individual analyte results were qualified as nondetect "U" based on blank contamination for the Subarea 5D North samples:

- Four-thousand two hundred and thirty-two dioxin results (50%); 24 NDMA results (11%); 612 metal results (4%); eight hexavalent chromium results (1.6%); 74 mercury results (8.4%); two alcohol/terphenyl results (0.15%); 20 TPH/glycol result (1.1%); one PCB/PCT result (0.016%); 317 VOC results (2.3%); 20 SVOC results (0.08%); and 31 SVOC SIM results (0.26%) were qualified as non-detect due to blank contamination criteria

The following individual analyte results were qualified as estimated "U" based on blank contamination for the Subarea 5D South samples:

- 408 dioxin results (40%), 66 metal results (3.7%), and three mercury results (5%) were qualified as non-detect due to blank contamination criteria

The percentage of results qualified as non-detect based on laboratory blank contamination was less than or equal to 5% for all these analyses except for the following analytes: 50 percent of the dioxins for Subarea 5D North; 40 percent of the dioxins for Subarea 8 South; 11 percent of the NDMA results for Subarea 5D North; and eight percent of the mercury results for Subarea 5D North.

Estimated detection limits (EDLs) for the dioxins are calculated for each sample. The EDLs for this analysis are very low, reported in ng/kg or parts per trillion, resulting in numerous results qualified as estimated "J" values because they are below the RL. Many of these estimated values have been subsequently qualified as nondetect "U" because the compound was detected in related laboratory blanks. Low level detections of dioxin analytes are somewhat inevitable because of the nature and universal extent of the compounds. The dioxin levels found in the blanks were well below site-related action levels. Therefore, the resulting qualification of associated sample results as not detected or "U" qualified data do not falsely diminish identification of site-related contaminants.

The other reported analytes that had blank qualifications greater than 5 percent do not indicate a laboratory blank contamination problem as the overall sample counts for those analytes were low. For example, there were only 214 NDMA samples analyzed for Subarea 5D North and out of those samples 24 NDMA results were qualified due to blank contamination.

Tables C-2 through C-5 provide a summary of chemicals observed in the equipment and trip blank samples. Most of the equipment blanks and trip blanks detected compounds were below the RLs but above the MDLs. Compounds detected above the RL in equipment and trip blanks are highlighted yellow in the associated tables. The ASTM Type II water used to generate the equipment and travel blanks was previously analyzed as a field blank on April 27, 2011. This field blank (source water) had detections of naphthalene (above the RL) indicating inherent low level contamination in the source water used.

ASTM Type II water is not typically certified “clean” to the low RLs established for the low level methods used for the co-located sampling program. A review of the

ASTM Type II field blanks for all Phase 1 sampling showed one detect of heptachlor, three detects of naphthalene, and one detect of RDX above their respective RL. One field blank had detects above the RLs for four metal analytes and one field blank had detects above the RLs for a variety of VOC analytes. A review of ASTM Type II water field blanks will continue to monitor for detected concentrations of analytes throughout the sampling program.

A review of all Phase 1 equipment blanks was also performed. In general, a variety of analytes were detected above their respective RLs. The most frequently detected analytes were naphthalene, NDMA and RDX. Napthalene was detected in 28 percent of the equipment blanks, NDMA in 27 percent of the equipment blanks and RDX in 26 percent of the equipment blanks. Other analytes were detected in the equipment blanks with methylene chloride being detected in eight percent of the equipment blanks. All other analytes were detected in less than five percent of the equipment blank samples.

Further review of the equipment blanks is being conducted and all Phase 3 equipment blanks collected to-date are being evaluated to determine if these low level detections are consistent indicating a possible deficiency in decontamination procedures and/or source water impacts that need to be addressed and corrected. Associated sample results were qualified accordingly during the validation process regarding field blank contamination. No sample results were rejected due to detected concentrations in field blanks or laboratory blanks.

C.7.4 Representativeness, Comparability, and Sensitivity

Representativeness, comparability, and sensitivity are achieved by using EPA-approved sampling procedures and analytical methodologies. By following the procedures described in the WP/FSAP (CDM 2011a) for this sampling event and future sampling events, sample analysis should yield results representative of environmental conditions at the time of sampling. Similarly, reasonable comparability of analytical results for this and future sampling events can be achieved if approved EPA analytical methods and standardized reporting units are employed.

C.7.4.1 Representativeness

Representativeness is a qualitative term that expresses the degree to which the sample data accurately and precisely represent the environmental conditions corresponding to the location and depth interval of sample collection. Requirements and procedures for sample collection are designed to maximize sample representativeness.

Representativeness also can be monitored by reviewing field documentation and/or by performing field audits. For this report, a detailed review was performed on the COC forms, field data collection forms, laboratory sample confirmation logs, and data validation packages. Laboratory QA/QC requirements were included in the WP/FSAP (CDM 2011a) and laboratory statements of work (SOWs) to ensure that the laboratory analytical results were representative of true field conditions.

Field sampling accuracy was attained through strict adherence to the approved WP/FSAP (CDM 2011a) and by using approved standard operating procedures for field data collection. Based on this, the data should represent as near as possible the actual field conditions at the time of sampling.

Representativeness has been achieved by the performed field work and laboratory analyses. The analytical data generated, that have not been rejected, are viewed to be a representative characterization of the project area.

C.7.4.2 Comparability

Comparability is a qualitative term that expresses the confidence with which a data set can be compared with another. Strict adherence to standard sample collection procedures, analytical detection limits, and analytical methods assures that data from like samples and sample conditions are comparable. This comparability is independent of laboratory personnel, data reviewers, or sampling personnel. Comparability criteria are met for the project if, based on data review, the sample collection and analytical procedures are determined to have been followed, or defined to show that variations did not affect the values reported.

To ensure comparability of data generated for the site, standard sample collection procedures and Department of Toxic Substances Control (DTSC)-approved analytical methods were utilized by CDM. The sample analyses were performed by LLI in Lancaster, Pennsylvania. Utilizing such procedures and methods enables the current data to be comparable with previous and future data sets generated with similar methods.

C.7.4.3 Sensitivity

Sensitivity is related to the ability to compare analytical results with project-specific levels of interest, such as risk-based screening levels or action levels. Analytical detection limits for the various sample analytes should be below the level of interest to allow an effective comparison.

Detection Limits

Each analytical method used during the sampling events was selected because it had potential to achieve RLs established for this project. RLs were established for each analyte in consultation with the laboratory to achieve analytical results at or below regulatory comparison criteria.

The method detection limit (MDL) is defined as the concentration of an analyte that produces a signal with a 99 percent confidence that the concentration is above that of a blank but that that concentration cannot be accurately quantified. A blank is a sample that does not contain measurable concentrations of the analyte of concern. Tested by statistical performance, calibration samples, and LCSs, MDLs represent the best fundamental measurement of instrument sensitivity and the basis for establishing RLs.

The laboratory RL is typically about 3 to 5 times higher than the MDL and is a laboratory-specific number. The actual sample RL is variable based on the sample matrix, moisture content, and other sample-specific factors. When a sample has to be diluted before analysis, either because of matrix problems or to bring the instrument response within the linear dynamic range, the RL is raised by a factor corresponding to the dilution factor.

In reporting environmental sample results, laboratories follow protocols that help ensure that the result reported is at the lowest level and is defensible, taking into account the ability of the instrument to differentiate a signal generated by the analyte from the background instrument noise, imprecision added to the detection capabilities of the analyte due to the sample processing manipulations (MDLs) and sample matrix affects, and adjustments made to the detection limits based on difficulties encountered in analyzing the sample (dilution factors, etc.).

The result for an analyte is flagged with a "U" if that analyte was not detected, or qualified with a "J" flag if blank or other QC results fall outside the appropriate tolerance limits. If an analyte is present at a concentration between the MDL and the RL, the analytical result is flagged with a "J," indicating an estimated quantity. Qualifying the result as an estimated concentration reflects increased uncertainty in the reported value.

The following analyses and individual analyte sample results were qualified as estimated "J" due to the sample results being reported as detected below the RL for Subarea 5D North samples:

- Method 1613B (Dioxins)
  - 3,919 individual analyte results
- Method 1625C (NDMA)
  - 37 individual analyte results
- Method 300 (Fluoride/Nitrate)
  - 72 individual analyte results
- Methods 6010B/6020 (Metals)
  - 1,692 individual analyte results
- Method 6850 (Perchlorate)
  - 9 individual analyte results
- Method 7199 (Hexavalent Chromium)
  - 312 individual analyte results
- Method 7471A (Mercury)
  - 182 individual analyte results

- Method 8015B (Alcohols and terphenyls)
  - 12 individual analyte results
- Method 8015M (TPHs and glycols)
  - 111 individual analyte results
- Method 8081A (Pesticides)
  - 260 individual analyte results
- Method 8082 (PCBs)
  - 195 individual analyte results
- Method 8151A (Herbicides)
  - 83 individual analyte results
- Method 8260B (VOCs)
  - 101 individual analyte results
- Method 8270C (SVOCs)
  - 417 individual analyte results
- Method 8270C SIM (SVOCs)
  - 1,127 individual analyte results
- Method 8315A (Formaldehyde)
  - 8 individual analyte results
- Method 8330A (Energetics)
  - 11 individual analyte results
- Method 9012B (Cyanide)
  - 2 individual analyte results

The following analyses and individual analyte sample results were qualified as estimated "J" due to the sample results being reported as detected below the RL for Subarea 5D South samples:

- Method 1613B (Dioxins)
  - 457 individual analyte results
- Method 300 (Fluoride/Nitrate)
  - 1 individual analyte results
- Methods 6010B/6020 (Metals)
  - 201 individual analyte results
- Method 6850 (Perchlorate)
  - 2 individual analyte results

- Method 7199 (Hexavalent Chromium)
  - 29 individual analyte results
- Method 7471A (Mercury)
  - 20 individual analyte results
- Method 8015M (TPHs and glycols)
  - 1 individual analyte results
- Method 8081A (Pesticides)
  - 50 individual analyte results
- Method 8082 (PCBs)
  - 46 individual analyte results
- Method 8151A (Herbicides)
  - 9 individual analyte results
- Method 8270C (SVOCs)
  - 19 individual analyte results
- Method 8270C SIM (SVOCs)
  - 214 individual analyte results

As discussed in Section C.7.3, the EDLs for the dioxins are calculated for each sample and are very low resulting in numerous results qualified as estimated "J" values because they are below the RL as indicated above. The qualification of the dioxins results as estimated “J” based on RL criteria does not falsely diminish identification of site-related contaminants.

RLs for the modified methods identified in Table 2-3 of the Subarea 5D North and 5D South TM are evaluated through the analysis of RL-LCS and RL-MS samples created by LLI. The evaluation of these QC samples is ongoing throughout all subareas and recommendations regarding program-wide sample qualification based on the RL-LCS and RL-MS QC results have not been finalized. Qualification of individual sample results for Subareas 5D North and 5D South, based on the current RL-LCS and RL-MS QC sample results, was not performed.

In general, for the data validated in this report, detection limits for the sample results were low enough to compare to the action levels stated in the WP/FSAP (CDM 2011a). The detection limits for this project are lower than "normal" environmental data analyses. Analytical laboratory methods were modified in order to achieve the lowest practicable RL. Current laboratory instrumentation technology cannot achieve all of these low project RLs, and thus some of the RLs were above project criteria. These results are still considered usable for project decisions.

C.8 Review of Selected Validation Reports

CDM performed a review of 10 percent of the validation reports identified in Table C-1. This review involved comparing the validation report results against the laboratory data packages as well as the validation guidance documents. All validation report results that were reviewed were verified against the laboratory data packages and determined that validation documents were followed as required.

C.9 Data Completeness

Completeness of the data collection program is defined as the percentage of samples planned for collection as listed in the WP/FSAP (CDM 2011a) versus the actual number of samples collected during the field program (see equation A).

Completeness for acceptable data is defined as the percentage of acceptable data obtained judged to be valid versus the total quantity of data generated (see equation B). Acceptable data include both data that pass all the QC criteria (unqualified data) and data that may not pass all the QC criteria but had appropriate corrective actions taken (qualified but usable data).

A. $$\%\text{Completeness} = Cx\frac{100}{n}$$

Where:

C = actual number of samples collected
n = total number of samples planned

B. $$\%\text{Completeness} = Vx\frac{100}{n'}$$

Where:

V = number of measurements judged valid
n' = total number of measurements made

The overall completeness goal, as defined in the WP/FSAP (CDM 2011a), for these sampling events was 90 percent for all project data.

A total of 523 Subarea 5D North and 63 Subarea 5D South soil samples including the field duplicates were collected and analyzed. As discussed in Section 2.7 of the TM, 201 locations were to be sampled in Subarea 5D North and 36 locations in Subarea 5D South. Some locations required only a subsurface sample while other locations required both a surface and subsurface sample. The number of subsurface samples to be collected at each location is not pre-determined because the total depth of each boring varies depending on the local geology. Hence, the completeness calculation defined in Equation A above is more accurately reflected by identifying whether all the locations were sampled at versus the actual number of samples collected since that is not pre-determined. Of all the locations indicated for collection in Subareas 5D North and 5D South, only two locations in Subarea 5D North was one location in

Subarea 5D South was not sampled due shallow refusal on sandstone or siltstone as noted in Table 2.1 and 2.2 and stated in Section 2.7. The remaining deviations from the proposed sample collection for Subareas 5D North and 5D South were due to shallow refusal on bedrock. For all of these locations, a surface sample was successfully collected.

As discussed in Section 2.7, the sampling deviations do not impact completeness objectives for this sampling event. Ninety-nine percent of the sample locations identified in the WP/FSAP Addendum were sampled meeting the completeness goal for the number of locations sampled versus number of locations planned to be sampled.

The completeness goal for acceptable data achieved was 99.82 percent of the number of measurements judged to be valid versus the total number of measurements made for all Subarea 5D North and 99.77 percent for Subarea 5D South samples analyzed. Tables C-8 and C-9, Completeness Calculation Summary, show a summary of the results that were estimated or rejected.

The following Subarea 5D North individual analyte results were rejected per analyses:

- Method 300
  - One out of 706 fluoride results (0.14 percent)
- Method 6020
  - One out of 7,952 antimony results (0.01 percent)
- Method 8015B
  - Three out of 1,254 alcohol/terphenyl individual analyte results (0.24 percent)
- Method 8015M
  - Three out of 1,798 TPH individual analyte results (0.17 percent)
- Method 8081A
  - Seventy-two out of 3,843 individual pesticide analyte results (1.87 percent)
- Method 8082
  - Ten out of 5,964 individual PCB/PCT analyte results (0.17 percent)
- Method 8151A
  - Fifty out of 1,830 individual herbicide analyte results (2.7 percent)
- Method 8270C
  - Eleven out of 24,315 individual SVOC analyte results (0.05 percent)
- Method 8330A
  - Thirty out of 4,248 individual energetic analyte results (0.71 percent)

The following Subarea 5D South individual analyte results were rejected per analyses:

- Method 8081A
  - One out of 672 individual pesticide analyte results (0.15 percent)
- Method 8151A
  - Sixteen out of 310 individual herbicide analyte results (5.16 percent)
- Method 8270C
  - Four out of 2,788 individual SVOC analyte results (0.14 percent)

The completeness goals for both the locations sampled and the number of measurements judged to be valid were met.

Sampling deviations from that described in the WP/FSAP (CDM Smith 2011a) are discussed in Section 2.7 of the TM. Deviations did not impact DQOs for this sampling event. The data reported and not rejected are suitable for their intended use for characterization of Area IV of SSFL. The DQIs identified in the WP/FSAP (CDM 2011a) met appropriate criteria. The achievement of the completeness goals for the data indicates a sufficient amount of usable data has been generated on which to base project decisions.

C.10 Assessment of Data Usability and Reconciliation with WP/FSAP Goals

Over 99 percent of the data validated and reported for Subarea 5D North and Subarea 5D South are suitable for their intended use for site characterization. Sample results that were rejected are not suitable for project use. The rejected analyte results do not impact achievement of the overall project objectives. The detection limits reported generally met the expected limits proposed by the analytical laboratory in their contract agreement with CDM.

Sample results that were qualified as estimated are usable for project decisions. Numerous dioxin results were qualified as estimated and/or non-detect due to the low detection limits. This data is considered usable.

Field duplicate precision also met criteria a majority of the time. RPDs were outside criteria predominantly when the sample results were close to the RL and/or below the project required action limits. Decisions based on results close to the RL should be made with a degree of caution. The achievement of the completeness goals for number of samples collected, and the number of sample results acceptable for use provides sufficient quality data to support project decisions.

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